

of pressure, apparently due to the advance of an area of high pressure from the north, while from the same cause the disturbance in Colorado was forced southward to New Mexico, and apparently divided—one portion passing over Texas and developing energy which resulted in the general storm traced as *vi a*. It passed from Texas northeastward over the Lake region from the 15th to 17th, attended by general rains in all districts east of the Mississippi and by snows in the Northwest. The rains attending this storm were heavy in the Ohio Valley and middle Atlantic and Southern States, and damaging floods occurred in the rivers of South Carolina. This storm moved at the rate of about sixty miles per hour during the first twelve hours of its northeasterly movement from northern Texas to northern Illinois. Its movement was somewhat retarded while passing over the upper lake region, and its direction was deflected toward the north. After passing the upper lake region the northeasterly movement was resumed. That portion of the low area which was apparently forced westward over New Mexico and Utah remained about stationary during the 15th and 16th, and finally disappeared by a gradual increase of pressure without causing any marked disturbance.

VII.—Number vii developed in southern Texas on the 17th, when the pressure was low over the Rio Grande Valley and New Mexico and an area of high pressure covered the northern portion of the eastern Rocky Mountain slope. It passed rapidly to the northeast, moving at the rate of seventy-five miles per hour during the night of the 17th, the centre of disturbance

passing from southern Mississippi to western Pennsylvania, the barometer at the centre falling from 29.68 to 29.36 during this interval. This rapid movement was apparently due to the southerly movement of the area of high pressure and attending cold wave to the westward, which caused a "norther" in the Southwest and a cold wave over the central valleys. The northeasterly movement continued during the 18th and 19th, and the depression disappeared to the northeast of New England on the latter date, but the westerly gales continued on the north Atlantic coast until the 20th.

VIII.—Number viii developed in northern Montana on the 20th and passed rapidly eastward over Dakota, Minnesota, and the upper lake region, preceded by fair weather and warm southerly winds and followed by general snows and the most decided cold wave of the month. Although the pressure at the centre of this disturbance remained near 29.90 during its passage over the continent, the barometric gradient to the westward was well marked, owing to the unusually high barometric readings within the high area to the westward. The rapid easterly movement continued after passing the Lake region, and it disappeared on the 23d to the east of Nova Scotia.

IX.—Number ix appeared far to the north of Montana on the 27th, although the pressure was low in that region during the 26th, and also on the north Pacific coast on the 25th. It passed eastward as far as Manitoba, where it was central at the close of the month, but the pressure had increased at the centre during the easterly movement.

NORTH ATLANTIC STORMS FOR FEBRUARY, 1889 (pressure in inches and millimetres; wind-force by Beaufort scale).

The paths of the depressions that appeared over the north Atlantic Ocean during February, 1889, are shown on chart i. These paths have been determined from international simultaneous observations by captains of ocean steamships and sailing vessels, received through the co-operation of the Hydrographic Office, Navy Department, and the "New York Herald Weather Service."

Seven depressions have been traced for February, 1889, of which five advanced over or near Newfoundland; one apparently developed south of Nova Scotia, and one first appeared southwest of the British Isles. The approximated paths of two depressions of great strength which appeared between the Azores and the West Indies in the latter part of January, 1889, are also shown on this chart.

Over the western portion of the ocean the weather during February, 1889, continued generally unsettled, with gales of varying force, until the 23d, after which fair weather predominated, until the close of the month. Over mid-ocean the stormy periods were the 9th, 13th to 17th, 21st and 22d, the remainder of the month being characterized by unusually fine weather and generally high barometric pressure. Over and near the British Isles the storm periods extended from the 1st to 3d, 8th to 11th, 13th to 16th, and 26th to 28th, the severest storms occurring during the first decade of the month.

As compared with the corresponding month of previous years, the storms of the north Atlantic during February, 1889, were deficient in number and energy, more particularly over mid-ocean. Barometric pressure falling below 29.00 (737) was reported on but two dates, on the 3d over the northern portion of the British Isles, and on the 12th to the southward of Nova Scotia, while in preceding years correspondingly low pressure has been more frequently noted in February.

The following extract from a report by Captain Brillonnin, of the French s. s. "Ville de Bordeaux," indicates the severe character of the disturbances which attended the depression traced between the West Indies and the Azores from the 26th to the 28th, inclusive: "26th, noon, position by dead reckoning, N. 25° 27', W. 54° 18'; sea growing higher and higher; barometer fell to 29.69 (754); the wind, from e. by s., in violent squalls alternated with calms all the afternoon; sea always

growing worse; 9.30 p. m., barometer 29.49 (749); midnight, blowing a hurricane; barometer 29.33 (745), after which it rose gradually. 27th, 4 a. m., barometer 29.41 (747); sea frightful from e. to ne. and n.; squalls of great violence from e. Wind backed to ne., nne., and n. during the 27th, and the barometer continued to rise."

The following abstract from the log of the s. s. "Hungarian," Capt. A. Langlois, commanding, shows the general character of the storms which attended the depression whose approximated path is charted southwest of the Azores on January 26th and 27th: "25th, fresh se. wind and very hard squalls of wind and rain; sea very much confused from se. and westward; noon, in N. 33°, W. 40°, wind very unsteady in force from n.; 3 p. m., hard squalls from nw.; 4 p. m., fresh gale from nw.; barometer stopped falling at 29.38 (746); midnight, hard gale and very heavy sea. 26th, 1 a. m., furious gale and terrific sea, sweeping clear over the ship; noon, in N. 31°, W. 42°, moderating a little; wind backing to westward and rather less sea."

The following are brief descriptions of the depressions traced during February, 1889:

1.—This depression was a continuation of low area i, and on the 2d was central over the east portion of the Gulf of Saint Lawrence, with pressure falling below 29.30 (744) and fresh to strong gales to the thirtieth parallel. By the 3d the storm-centre had passed to the northward of Newfoundland beyond the region of observation.

2.—This depression apparently developed northwest of Bermuda on the 3d, and thence moved northeast to the forty-first parallel by the 4th, whence it probably passed northward over Newfoundland, its course being attended throughout by gales of moderate strength.

3.—This depression was a continuation of low area iii, which caused severe gales off the middle Atlantic and New England coasts during the 6th and 7th, and by the morning of the 7th had advanced over the Gulf of Saint Lawrence. Moving north of east the depression was central north of the Banks of Newfoundland on the 8th, and thence moved north of east to the thirty-fourth meridian by the 9th, and at noon, Greenwich time, of the 10th, had apparently advanced to the north of

Ireland, where it displayed considerable energy and occasioned hard gales over and near the British Isles during that and the following date. During the 11th the centre of disturbance moved eastward over the North Sea.

4.—This depression apparently originated north of the Bahamas, and on the morning of the 11th was central off the North Carolina coast, with pressure below 29.70 (754) and moderate to fresh gales. By the 12th the centre of disturbance had moved northeast to the thirty-ninth parallel, attended by gales of hurricane force, and pressure falling below 29.00 (737). On this date the lowest barometer reading reported during the month, 28.32 (719), was noted by Captain Saville, of the s. s. "Lemuria," at noon, in N. 36° 50', W. 66° 58'. During the 13th the depression passed northeastward over Newfoundland, and thence advanced north of east and disappeared north of the British Isles after the 15th, its passage being attended by an apparent gradual decrease in energy.

5.—This depression was central over the Gulf of Saint Lawrence on the 14th, with central pressure below 29.40 (747). On the morning of the 15th the storm was central over Newfoundland, where pressure falling below 29.30 (744) was indicated, whence it moved north of east to the thirty-ninth meridian by the 16th, attended by fresh to whole gales. By the 17th the centre of depression had moved southeast to the forty-ninth parallel, after which it disappeared in the vicinity of the Azores. A marked loss of energy was evidenced on the part of this storm after the 16th.

6.—This depression was a continuation of low area vii which passed eastward over the Gulf of Saint Lawrence, with pressure below 29.30 (744). Advancing eastward to the thirtieth meridian by the 22d the storm-centre moved thence southeastward and disappeared northeast of the Azores, its course after the 20th being attended by gales of diminishing strength.

7.—This depression first appeared southwest of the British Isles on the 26th, where pressure falling to about 29.50 (749) and strong to whole gales were reported. By noon, Greenwich time, of the 27th the centre of depression had apparently moved eastward over the French coast.

OCEAN ICE IN FEBRUARY.

The following table shows the southern and eastern limits of the region within which icebergs or field-ice were reported for February during the last seven years:

Southern limit.			Eastern limit.		
Month.	Lat. N.	Long. W.	Month.	Lat. N.	Long. W.
February, 1883.....	42 01	52 46	February, 1883.....	46 19	45 44
February, 1884.....	42 00	50 00	February, 1884.....	46 50	43 45
February, 1885.....	41 50	51 12	February, 1885.....	47 52	42 00
February, 1886.....	46 10	47 15	February, 1886.....	48 00	44 47
February, 1887.....	40 00	48 00	February, 1887.....	46 26	41 50
February, 1888.....	44 59	45 08	February, 1888.....	44 59	45 08
February, 1889.....	45 35	48 00	February, 1889.....	45 35	48 00

From the above it will be seen that during February, 1889, ice was encountered about two and one-half degrees north and four degrees west of the average southern and eastern limits for the month, as determined from reports made during the preceding six years.

Field ice has been reported for February, 1889, as follows: 24th, s. s. "Mars," off the Banks, passed through small pieces of detached ice for thirty hours. Schr. "Herman Babion" (no date), eighty miles west one-half south of Saint Pierre, Miquelon, encountered heavy drift ice, which extended all the way to Scatari. Schr. "Cecil H. Low" (no date), twenty

miles southwest from Scatari, heavy field ice. Ship "William Cochran," in N. 45° 35', W. 48°, one piece of field ice fifty feet long, just awash.

No icebergs have been reported for February, 1889. This fact constitutes an unusual feature, as with the exception of the current and the preceding year, icebergs have been encountered over or near the Grand Banks in February since, and including, 1883. The field ice reported was also largely deficient, when compared with the average for the month.

FOG IN FEBRUARY.

The following are limits of fog-areas on the north Atlantic Ocean during February, 1889, as reported by shipmasters:

Date.	Entered.			Cleared.			Date.	Entered.			Cleared.		
	Lat. N.	Lon. W.		Lat. N.	Lon. W.			Lat. N.	Lon. W.		Lat. N.	Lon. W.	
1	45 12	50 28		45 06	51 13		16-17	40 48	73 00		Sandy Hook.		
4	45 26	49 39		45 43	48 30		17	41 00	66 30		40 45	67 33	
4	44 02	48 32		43 38	50 15		17	40 39	68 32		40 27	70 13	
4-5	44 37	46 56		42 28	52 36		17	39 55	68 48		40 25	69 10	
4-5	42 50	49 50		43 50	53 40		17-18	35 25	75 20		37 00	75 30	
4-5	45 41	50 48		46 30	47 44		18	40 27	73 55		New York.		
6	43 11	53 24		43 27	52 33		18	40 28	70 15		40 40	71 00	
6-7	42 50	60 30		42 30	63 30		18	41 40	53 30		41 22	64 20	
7	45 15	43 35		45 36	42 38		18-19	44 35	55 30		43 36	56 30	
7	42 39	52 36		42 50	50 20		18-19	42 51	50 55		42 40	53 59	
7-8	48 06	43 35		45 55	49 05		19	46 08	57 12		45 35	58 16	
12	43 19	48 41		42 55	49 59		19	43 45	54 34		43 37	55 56	
13	45 20	51 07		45 20	53 30		19-20	40 57	45 04		47 36	42 09	
13-14	42 45	49 07		42 54	48 35		19-20	45 30	47 30		44 50	51 09	
15	32 06	80 32		32 08	80 35		20	44 27	51 37		45 14	54 12	
16-17	35 35	75 20		NE. light-ship.			24	44 49	47 58		45 01	48 37	
16-17	Galveston.			27 30	91 30								

The limits of fog-belts west of the fortieth meridian are shown on chart i by dotted shading. In the vicinity of the Banks of Newfoundland fog was reported on thirteen days, as compared with five days for January, 1889, and seventeen days for February, 1888. Between the fifty-fifth and sixty-fifth meridians fog was reported on four days, as compared with ten days in January, 1889, and eight days in February, 1888. To the westward of the sixty-fifth meridian fog was reported on three days, as compared with five days in January, 1889, and eleven days in February, 1888. As compared with the preceding month a marked increase in fog frequency is shown near the Grand Banks, while to the westward of the fifty-fifth meridian there has been a decrease. The southern limit of fog has extended southward over the trans-Atlantic tracks east of the fifty-fifth meridian.

During the 16th and 17th dense fog was encountered in the Gulf of Mexico from Galveston, Tex., east-southeast to about W. 91° 30', with rain, s. to sse. winds, and fresh ssw. winds at times. On the 15th fog was reported off Savannah, Ga., with variable winds and rain. On the 1st, 4th, 12th to 14th, and 18th to 20th fog was reported over or near the Banks of Newfoundland, with south to east winds, occasioned by the approach or passage of areas of low pressure. From the 5th to 8th, inclusive, fog occurred in that region, attending the passage of an area of low pressure from over the middle Atlantic states to the north of Newfoundland, and on the 24th fog was noted, with fresh, variable winds. On the four dates for which fog was reported between the fifty-fifth and sixty-fifth meridians, areas of low pressure were located, respectively, over New England, the middle Atlantic states, and the Gulf of Saint Lawrence. Fog was reported off the Atlantic coast of the United States on the 16th, 17th, and 18th, with rain and variable winds. On the 18th a storm of considerable energy, which had advanced from the southwest, was central over the middle Atlantic states.

TEMPERATURE OF THE AIR (expressed in degrees, Fahrenheit).

The distribution of mean temperature over the United States and Canada for February, 1889, is exhibited on chart ii by dotted isotherms. In the table of miscellaneous meteorological data the

monthly mean temperatures and the departures from the normal are given for regular stations of the Signal Service. The figures opposite the names of the geographical districts in the